

## Bruce Tsurutani

### Professional Experience

- Jet Propulsion Laboratory (1972-Present)
  - Senior Research Scientist (equivalent to Professor at Cal Tech or equivalent University) (1985-Present)
  - Research Scientist (1972-1985)
  - Manager of the Space Physics and Astrophysics Section (1985-1987)
  - Leader of space plasma physics group (1987-2004)
- Visiting Associate, Plasma Group, California Institute of Technology, Nov 2012-Mar 2013
- Visiting Professor, Brazilian National Space Research Institute (INPE), Sao Jose dos Campos, SP, Brazil, Sept-Oct 2010
- Visiting Scientist, Technical University of Braunschweig, Germany, May-Aug, 2010
- Visiting Professor, Kyoto University (Oct. 2006- April 2007)
- Visiting Professor, Kyoto University (August- Nov 2005)
- Adjunct Professor, Physics and Astronomy Department, University of Southern California (2004-Present)
- Visiting Associate, California Institute of Technology, Solar Physic Group (1996-2002)
- Visiting Scientist, National Oceanic & Atmospheric Administration SEL, Boulder CO (July-Aug, 1993)
- Visiting Professor University of Alaska, Geophysical Institute (July-Aug, 1992)
- Visiting Professor Kyoto University (Mar-July, 1988)
- PhD, 1972, University of California at Berkeley (K. A. Anderson, thesis advisor): *Energetic Electron Precipitation and Substorms*

---

### Selected Awards

- Listed in Reuters ISI as one of the top 250 referenced authors in both space sciences and geosciences.
- American Geophysical Union J.A.Fleming Medalist, 2009
- American Geophysical Union Fellow, 2009
- The Federal Univ. of Santa Maria (UFSM), Rio Grande do Sul, Brazil University Medal, 2009
- AGU Excellence in Refereeing awards (2007-JGR; 2003-GRL; 1984-GRL)
- Latin American Geophysical Society (ALAGE) Gold Medal, inaugural awardee (2001)
- Von Humboldt (Germany) Research Fellow (1993-1994), spent at Technical University of Braunschweig and Cologne University, Germany
- Brazilian National Space Medal (1992). Other awardees include: W. Von Braun, V. Suomi and Y. Gagarin. Only six awardees to date.
- President-Elect/President, AGU Space Physics and Aeronomy Section (1988-1992)
- Kyoto University International Scholarship (Oct, 1989)
- Secretary, AGU Solar Interplanetary Physics section (1982-1986)
- NASA awards (Exceptional Service Medals: 1985; 2001) and ~10 space flight team achievement awards

### Areas of Scientific Interest

Space Weather: Magnetic Storms and Substorms, Solar and Interplanetary Causes thereof

Nonlinear Plasma Waves (Evolution, Turbulence, Stochastic Particle Acceleration)

Plasma Physics (Instabilities and Wave-Particle Interactions)

Ionospheric Physics: The Dayside Superfountain Effect, Space Weather

Auroral and Magnetospheric Physics (Energetic Particle Precipitation, Auroras, Relativistic Electron Acceleration)

Solar Wind Interaction with Magnetospheres (Upstream Waves and Particles, Viscous Interaction)

Solar Corona Physics (Heating, flares, CMEs)

Astrophysics (X-Ray Bursters)

---

**Selected Publications (out of ~650)**

1. **Tsurutani, B.T.**, O.P. Verkhoglyadova, A.J. Mannucci, G.S. Lakhina, and J.D. Huba, Extreme changes in the dayside ionosphere during a Carrington-type magnetic storm, *J. Space Weath. Space Clim.*, 2, A05, doi:10.1051/swsc/201 2004, 2012.
2. **Tsurutani, B.T.**, E. Echer, I. Richter, C. Koenders, K.-H. Glassmeier, SLAMS at comet 19P/Borrelly:DS1 observations, *Plan. Space Sci.*, doi.org/10.1016/j.pss.2012.11.002, 2012.
3. **Tsurutani, B.T.**, B.J. Falkowski, O.P. Verkhoglyadova, J.S. Pickett, O. Santolik and G.S. Lakhina, Dayside ELF electromagnetic wave survey: A Polar statistical study of chorus and hiss, *J. Geophys. Res.*, 117, doi:10.1029/2011PA17180, 2012.
4. Mannucci, A.J., **B.T. Tsurutani**, S.C. Solomon, O.P. Verkhoglyadova and J.P. Forbes, How do coronal hole storms affect the ionosphere?, *EOS*, 93, 8, 21 77 Feb, 2012.
5. **Tsurutani, B.T.**, E. Echer and W.D. Gonzalez, The solar and interplanetary causes of the recent minimum in geomagnetic activity (MGA23): a combination of midlatitude small coronal holes, low IMF Bz variances, low solar wind speeds and low solar magnetic fields, *Ann. Geophys.*, 29, doi:10.5194/angeo-29.2001, 1, 2011.
6. **Tsurutani, B.T.**, G.S. Lakhina, O.P. Verkhoglyadova, E. Echer, F.L. Guarnieri, Y. Narita, and D.O. Constantinescu, Magnetosheath and heliosheath mirror mode structures, interplanetary magnetic decreases, and linear magnetic decreases: Differences and distinguishing features, *J. Geophys. Res.*, 116, A02103, doi:10.1029/2010JA015913, 2011.
7. Lakhina, G.S., **B.T. Tsurutani**, O.P. Verkhoglyadova and J.S. Pickett, Pitch angle transport of electrons due to cyclotron interactions with the coherent chorus subelements, *J. Geophys. Res.*, 115, doi:10.1029/2009JA014885, 2010.

8. **Tsurutani, B.T.**, O.P. Verkhoglyadova, G.S. Lakhina and S. Yagitani, Properties of dayside outer zone (DOZ) chorus during HILDCAA events: Loss of energetic electrons, *J. Geophys. Res.*, **114**, A03207, doi:10.1029/2008JA013353, 2009.
9. **Tsurutani, B.T.**, K. Shibata, S.-I. Akasofu, and M. Oka, A two-step scenario for both solar flares and magnetospheric substorms: Short duration energy storage, *Earth, Planets, Space*, **61**, 555, 2009.
10. Tsurutani, B.T., O.P. Verkhoglyadova, A.J. Mannucci, A. Saito, T. Araki, K. Yumoto, T. Tsuda, M.A. Abdu, J.H.A. Sobral, W.D. Gonzalez, H. McCreadie, G.S. Lakhina, and V.M. Vasyliunas, Prompt penetration electric fields (PPEFs) and their ionospheric effects during the great magnetic storm of October 30-31, 2003, *J. Geophys. Res.*, **113**, A5, A05311, doi:10.1029/2007HA012879, 2008.
11. **Tsurutani, B.T.**, W.D. Gonzalez, A.L.C. Gonzalez, F.L. Guarnieri, N. Gopalswamy, M. Grande, Y. Kamide, Y. Kasahara, G. Lu, I. Mann, R. McPherron, F. Soraas and V. Vasyliunas., Corotating solar wind streams and recurrent geomagnetic activity: A review, *J. Geophys. Res.*, **111**, A07S01, doi:10.1029/2005JA011273, 2006.
12. **Tsurutani, B.T.**, D.L. Judge, F.L. Guarnieri, et al., The October 28, 2003 extreme EUV solar flare and resultant extreme ionospheric effects: Comparison to other Halloween events and the Bastille day event, *Geophys. Res. Lett.*, **32**, 3 L03S09, doi:10.1029/2004GL021475, 2005.
13. **Tsurutani, B. T.**, D. R. Clay, L. D. Zhang, B. Dasgupta, D. Brinza, M. Henry, A. Mendis, J. K. Arballo, S. Moses, and A. Mendis, Plasma clouds associated with Comet P/Borrelly dust impacts, *Icarus*, **167**, 89, 2004.
14. **Tsurutani, B.T.**, X.-Y. Zhou, and W.D. Gonzalez, A lack of substorm expansion phases during magnetic storms induced by magnetic clouds, in *Storm-Substorm Relationship*, edited by S. Sharma, Y. Kamide and G. Lakhina, Amer. Geophys. Un. Press, Wash. D.C., **142**, 23, 2004.
15. **Tsurutani, B.T.**, A. Mannucci, B. Iijima, M.A. Abdu, J.H.A. Sobral, W.D. Gonzalez, F. Guarnieri, T. Tsuda, A. Saito, K. Yumoto, B. Fejer, T.J. Fuller-Rowell, J. Kozyra, J.C. Foster, A. Coster and V.M. Vasyliunas, Global dayside ionospheric uplift and enhancement associated with interplanetary electric fields, *J. Geophys. Res.*, **109**, A08302, doi:10.1029/2003JA010342, 2004.
16. **Tsurutani, B.T.** and G.S. Lakhina, Cross-field particle diffusion in a collisionless plasma: A nonresonant and a resonant mechanism, *Plasmas in the Laboratory and in the Universe*, editors: G. Bertin, D. Farina and R. Pozzoli, Amer. Inst. Phys., **703**, 123, 2003.
17. **Tsurutani, B.T.**, W.D. Gonzalez, G.S. Lakhina and S. Alex, The extreme magnetic storm of September 1-2, 1859, *J. Geophys. Res.*, **108**, SSH 1-1, doi:10.1029/2002JA009504, 2003
18. **Tsurutani, B.T.**, L.D. Zhang, G.M. Mason, G. Lakhina, T. Hada, J.K. Arballo, and R.D. Zwickl, Particle transport in  $^3\text{He}$ -rich events: Wave-particle interactions and particle anisotropy measurements, *Annales Geophysicae*, **20**, 427, 2002.
19. Zhou, X.-Y. and **B.T. Tsurutani**, Interplanetary shock triggering of nightside geomagnetic activity: Substorms, pseudobreakups and quiescent events, *J. Geophys. Res.*, **106**, 18957, 2001.

20. **Tsurutani, B.T.**, X.-Y. Zhou, V.M. Vasyliunas, G. Haerendel, J.K. Arballo, and G.S. Lakhina, Interplanetary shocks, magnetopause boundary layers and dayside auroras: The importance of a very small magnetospheric region, *Surveys in Geophys.*, 22, 101, 2001.
21. **Tsurutani, B.T.**, G.S. Lakhina, D. Winterhalter, J.K. Arballo, C. Galvan and R. Sakurai, Energetic particle cross-field diffusion: Interaction with magnetic decreases (MDs), *Nonlinear Proc. in Geophysics*, 6, 235, 1999.
22. **Tsurutani, B. T.** and G. S. Lakhina, Some basic concepts of wave-particle interactions in collisionless plasmas, *Rev. Geophys.*, 35, 491, 1998.
23. **Tsurutani, B. T.** and W. D. Gonzalez, The interplanetary causes of magnetic storms: A review, in *Magnetic Storms*, edited by B. T. Tsurutani, W. D. Gonzalez, Y. Kamide, and J.K. Arballo, AGU Monograph, Wash. D.C., 98, 77, 1997.
24. **Tsurutani, B. T.**, K.-H. Glassmeier and F. M. Neubauer, A review of nonlinear low frequency (LF) wave observations in space plasmas: On the development of plasma turbulence, *Nonlinear Waves and Chaos in Space Plasmas*, edited by T. Hada and H. Matsumoto, Terra, Sci. Publ., Tokyo, 1, 1996. Kyoto, Japan, 1996.
25. **Tsurutani, B. T.**, K.-H. Glassmeier and F. M. Neubauer, An intercomparison of plasma turbulence at three comets: Grigg-Skjellerup, Giacobini-Zinner, and Halley, *Geophys. Res. Lett.*, 22, 1149, 1995.
26. **Tsurutani, B. T.**, W. D. Gonzalez, A.L.C. Gonzalez, F. Tang, J. K. Arballo, and M. Okada, Interplanetary Origin of geomagnetic activity in the declining phase of the solar cycle, *J. Geophys. Res.*, 100, 21717, 1995.
27. **Tsurutani, B. T.**, C. M. Ho, E. J. Smith, M. Neugebauer, B. E. Goldstein, J. S. Mok, J. K. Arballo, A. Balogh, D. J. Southwood, and W. C. Feldman, The relationship between interplanetary discontinuities and Alfvén waves: Ulysses observations, *Geophys. Res. Lett.*, 21, 2267, 1994.
28. **Tsurutani, B. T.** and W. D. Gonzalez, F. Tang, and Y. T. Lee, Great magnetic storms, *Geophys. Res. Lett.*, 19, 73, 1992.
29. **Tsurutani, B. T.**, M. Sugiura, T. Iyemori, B. E. Goldstein, W. D. Gonzalez, S. I. Akasofu, and E. J. Smith, The nonlinear response of AE to the IMF  $B_s$  driver: A spectral break at 5 hours, *Geophys. Res. Lett.*, 17, 279, 1990.
30. **Tsurutani, B.T.** and W.D. Gonzalez, The cause of high-intensity long duration continuous AE activity (HILDCAAs): interplanetary Alfvén wave trains, *Planet. Spa. Sci.*, 35, 405, 1987.
31. **Tsurutani, B. T.**, B. E. Goldstein, M. E. Burton, and D. E. Jones, A Review of the ISEE-3 Geotail magnetic field results, *Planet Space Sci.*, 34, 931, 1986.
32. **Tsurutani, B. T.**, and R. P. Lin, Acceleration of  $>47$  keV ions and  $>2$  keV electrons by interplanetary shocks at 1 AU, *J. Geophys. Res.*, 90, 1, 1985.
33. **Tsurutani, B.T.**, J.A. Slavin, E.J. Smith, R. Okida, and D.E. Jones, Magnetic structure of the distant geotail from -60 to -220 Re: ISEE-3, *Geophys. Res. Lett.*, 11, 1, 1984.
34. Pesses, M. E., J. A. Van Allen, **B. T. Tsurutani**, E. J. Smith and J. H. Wolfe, High time resolution observations of CIR proton events by Pioneer 11, *J. Geophys. Res.*, 89, 37, 1984.

35. **Tsurutani, B. T.**, E. J. Smith, R. R. Anderson, K. W. Ogilvie, J. D. Scudder, D. N. Baker, and S. J. Bame, Lion Roars and non-oscillatory drift mirror waves in the magnetosheath, *J. Geophys. Res.*, 87, 6060, 1982.
36. **Tsurutani, B. T.**, E. J. Smith, K. R. Pyle, and J. A. Simpson, Energetic protons accelerated at co-rotating shocks: Pioneer 10 and 11 observations from 1 to 6 AU, *J. Geophys. Res.*, 87, 7389, 1982.
37. Smith, E. J., **B. T. Tsurutani**, and R. L. Rosenberg, Observations of the interplanetary sector structure up to heliographic latitudes of 16°: Pioneer 11, *J. Geophys. Res.*, 83, 717, 1978.
38. Neugebauer, M., and **B. T. Tsurutani**, Can x-ray bursts be caused by substorms at a neutron star?, *Astrophys. J.*, 226, 494, 1978.
39. **Tsurutani, B. T.**, and E. J. Smith, Two types of ELF chorus in the outer magnetosphere and their substorm dependences, *J. Geophys. Res.*, 82, 5112, 1977.
40. **Tsurutani, B. T.**, and E. J. Smith, Postmidnight chorus: A substorm phenomenon, *J. Geophys. Res.*, 79, 118, 1974.

#### *Editor of Books*

1. *Recurrent Magnetic Storms: Corotating Solar Wind Streams*, edited by **B.T. Tsurutani**, R.L. McPherron, W.D. Gonzalez, G. Lu, J.H.A. Sobral, and N. Gopalswamy, Amer. Geophys. Un. Press, Wash. D.C., 167, 2006.
2. *From the Sun: Auroras, Magnetic Storms, Solar-Flares and Cosmic Rays*, edited by S. Suess and **B.T. Tsurutani**, Amer. Geophys. Un. Press, Wash. D.C., 1998.
3. *Magnetic Storms*, AGU monograph 98, edited by **B.T. Tsurutani**, W.D. Gonzalez, Y. Kamide, J.K. Arballo, 1997.
4. *Proceedings if the First U.S.-Russian Workshop on FIRE Environment*, IKI - Moscow, edited by O. Vaisberg and **B. Tsurutani**, Dec. 1995.
5. *Small Instruments for Space Physics*, NASA, Washington D.C., edited by **B. T. Tsurutani**, November 1993.
6. *Plasma Waves and Instabilities at Comets and in Magnetospheres*, edited by **B. T. Tsurutani** and H. Oya, Amer. Geophys. Un. Press, Wash. D.C., 53, 1989
7. *Collisionless Shocks in the Heliosphere: A Tutorial Review*, edited by R. G. Stone and **B. T. Tsurutani**, Amer. Geophys. Un. Press, Wash. D.C., 34, 1985
8. *Collisionless Shocks in the Heliosphere: Review of Current Research*, edited by **B. T. Tsurutani** and R. G. Stone, Amer. Geophys. Un. Press, Wash. D.C., 35, 1985